

USER'S MANUAL

BM811s
BM812s
BM815s
BM817s



1) SAFETY

This manual contains information and warnings that must be followed for operating the meter safely and maintaining the meter in a safe operating condition. If the meter is used in a manner not specified by the manufacturer, the protection provided by the meter may be impaired.

Observe proper safety precautions when working with voltages above 30 Vrms, 42.4 Vpeak or 60 VDC. These voltage levels pose a potential shock hazard to the user. Do not expose this product to rain or moisture. The meter is intended only for indoor use.

Keep your hands/fingers behind the hand/finger barriers (of the meter and the test probe assembly, where applicable) that indicate the limits of safe access of the hand-held parts during measurements. Inspect lead wires, connectors, and probes for damaged insulation or exposed metal periodically. If any defects are found, replace them immediately. Only use the test probe assembly provided with the meter or a UL Listed test probe assembly to the same meter ratings or better.

Optional offer premium test probe assembly using silicone lead wire insulation, at agent's discretion, is equipped with white inner insulation layers as wear indicators. Replace them immediately if any of the white layers has become visible.

Disconnect the test leads from the test points before changing functions.

The meter meets IEC/EN/BSEN/CSA_C22.2_No./UL standards of 61010-1 Ed. 3.1, 61010-2-033 Ed. 2.0 to Measurement Categories CAT III 1000V and CAT IV 600V ac & dc.

The accompanied test probe assembly meets IEC/EN/BSEN/CSA_C22.2_No./UL standards of 61010-031 Ed. 2.0 to the same meter ratings or better. The 61010-031 requires exposed conductive test probe tips to be $\leq 4\text{mm}$ for CAT III & CAT IV ratings. Refer to the category markings on your probe assemblies as well as on the add-on accessories (like detachable Caps or Alligator Clips), if any, for applicable rating changes.

INTERNATIONAL SYMBOLS



Marking of Electrical and Electronic Equipment (EEE). Do not dispose of this product as unsorted municipal waste. Contact a qualified recycler



Refer to the explanation in this Manual



Possibility of electric shock



Earth (Ground)



Meter protected throughout by Double Insulation or Reinforced insulation



Fuse



Direct Current (DC)



Alternating Current (AC)



Three-phase Alternating Current



Application around and removal from hazardous live conductors is permitted

BRIEF INFORMATION ON MEASUREMENT CATEGORIES

Measurement Category IV is applicable to test and measuring circuits connected at the source of the building's low-voltage MAINS installation. Examples are measurements on devices installed before the main fuse or circuit breaker in the building installation.

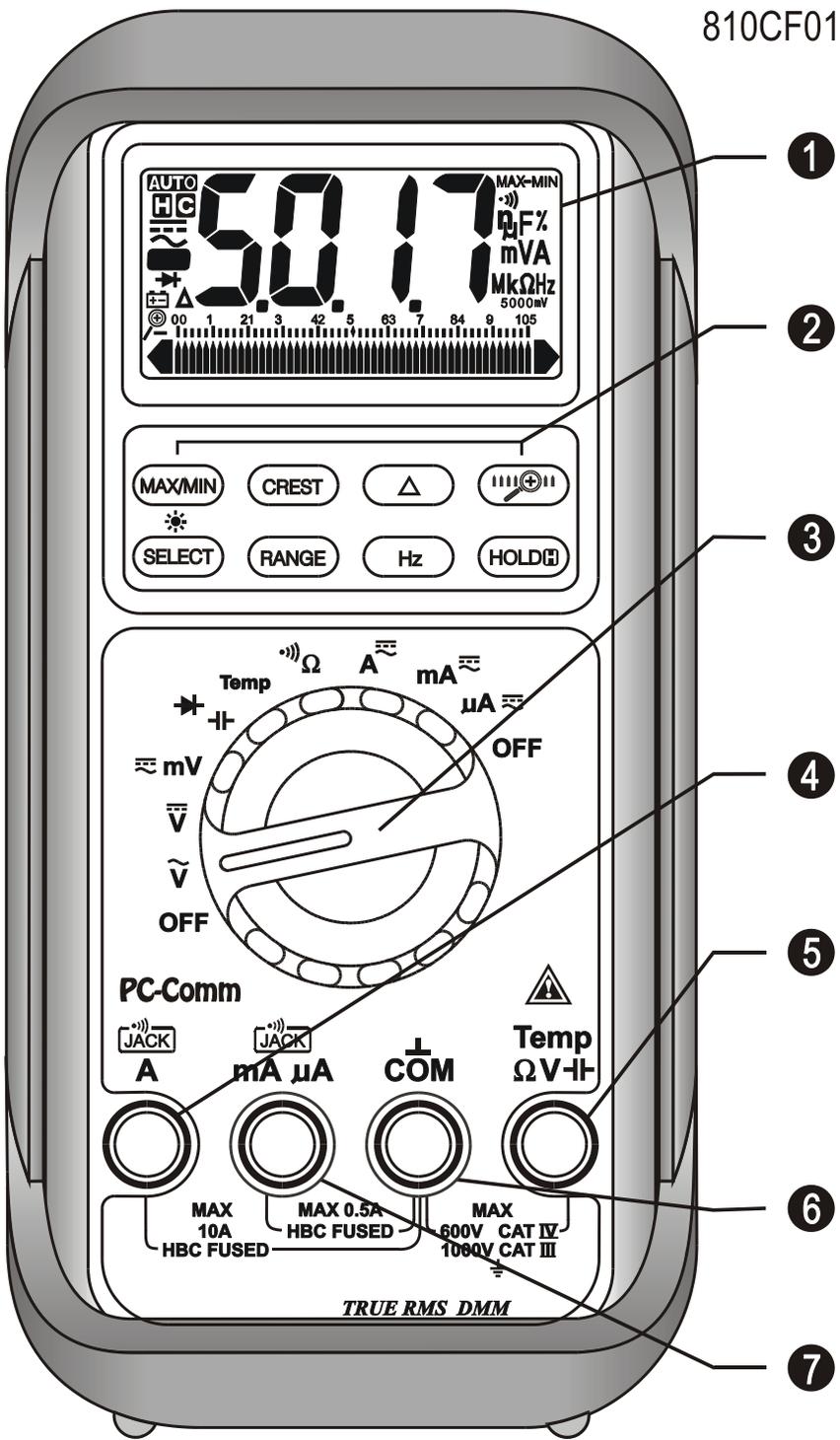
Measurement Category III is applicable to test and measuring circuits connected to the distribution part of the building's low-voltage MAINS installation. Examples are measurements on distribution boards (including secondary meters), circuit-breakers, cables, bus-bars, junction boxes, switches, socket-outlets, stationary motors in the fixed installation, and equipment for industrial use.

Measurement Category II is applicable to test and measuring circuits connected directly to utilization points (socket outlets and similar points) of the low-voltage MAINS installation. Examples are measurements on MAINS CIRCUITS of household appliances, portable tools and similar equipment.

2) EUROPEAN DIRECTIVES AND UK STATUTORY REQUIREMENTS

The instruments conform to EUROPEAN (CE) Low-Voltage Directive 2014/35/EU, Electromagnetic Compatibility Directive 2014/30/EU, and RoHS 2 Directive 2011/65/EU plus amendment Directive (EU) 2015/863. The instruments also conform to the UK (UKCA) Electrical Equipment (Safety) Regulations 2016, Electromagnetic Compatibility Regulations 2016, and The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012.

3) PRODUCT DESCRIPTION Panel Illustration



1) 3-4/5 digits 5000 counts LCD display

2) Push-buttons for special functions & features

3) Selector to turn the Power On or Off and Select a function

4) Input Jack for 10A (20A for 30sec) current function

5) Input Jack for all functions EXCEPT current (μ A, mA, A) functions

6) Common (Ground reference) Input Jack for all functions

7) Input Jack for milli-amp and micro-amp current functions

Analog bar-graph

The analog bar graph provides a visual indication of measurement like a traditional analog meter needle. It is excellent in detecting faulty contacts, identifying potentiometer clicks, and indicating signal spikes during adjustments.

Average sensing RMS calibrated

RMS (Root-Mean-Square) is the term used to describe the effective or equivalent DC value of an AC signal. Most digital multimeters use average sensing RMS calibrated technique to measure RMS values of AC signals. This technique is to obtain the average value by rectifying and filtering the AC signal. The average value is then scaled upward (calibrated) to read the RMS value of a sine wave. In measuring pure sinusoidal waveform, this technique is fast, accurate and cost effective. In measuring non-sinusoidal waveforms, however, significant errors can be introduced because of different scaling factors relating average to RMS values.

True RMS

True RMS is a term which identifies a DMM that responds accurately to the effective RMS value regardless of the waveforms such as: square, sawtooth, triangle, pulse trains, spikes, as well as distorted waveforms with the presence of harmonics. Harmonics may cause :

- 1)Overheated transformers, generators and motors to burn out faster than normal
- 2)Circuit breakers to trip prematurely
- 3)Fuses to blow
- 4)Neutrals to overheat due to the triplen harmonics present on the neutral
- 5)Bus bars and electrical panels to vibrate

Crest Factor

Crest Factor is the ratio of the Crest (instantaneous peak) value to the True RMS value, and is commonly used to define the dynamic range of a True RMS DMM. A pure sinusoidal waveform has a Crest Factor of 1.4. A badly distorted sinusoidal waveform normally has a much higher Crest Factor.

NMRR (Normal Mode Rejection Ratio)

NMRR is the DMM's ability to reject unwanted AC noise effect that can cause inaccurate DC measurements. NMRR is typically specified in terms of dB (decibel). This series has a NMRR specification of >60dB at 50 and 60Hz, which means a good ability to reject the effect of AC noise in DC measurements.

CMRR (Common Mode Rejection Ratio)

Common mode voltage is voltage present on both the COM and VOLTAGE input

terminals of a DMM, with respect to ground. CMRR is the DMM's ability to reject common mode voltage effect that can cause digit rolling or offset in voltage measurements. This series has a CMRR specifications of >60dB at DC to 60Hz in ACV function; and >120dB at DC, 50 and 60Hz in DCV function. If neither NMRR nor CMRR specification is specified, a DMM's performance will be uncertain.

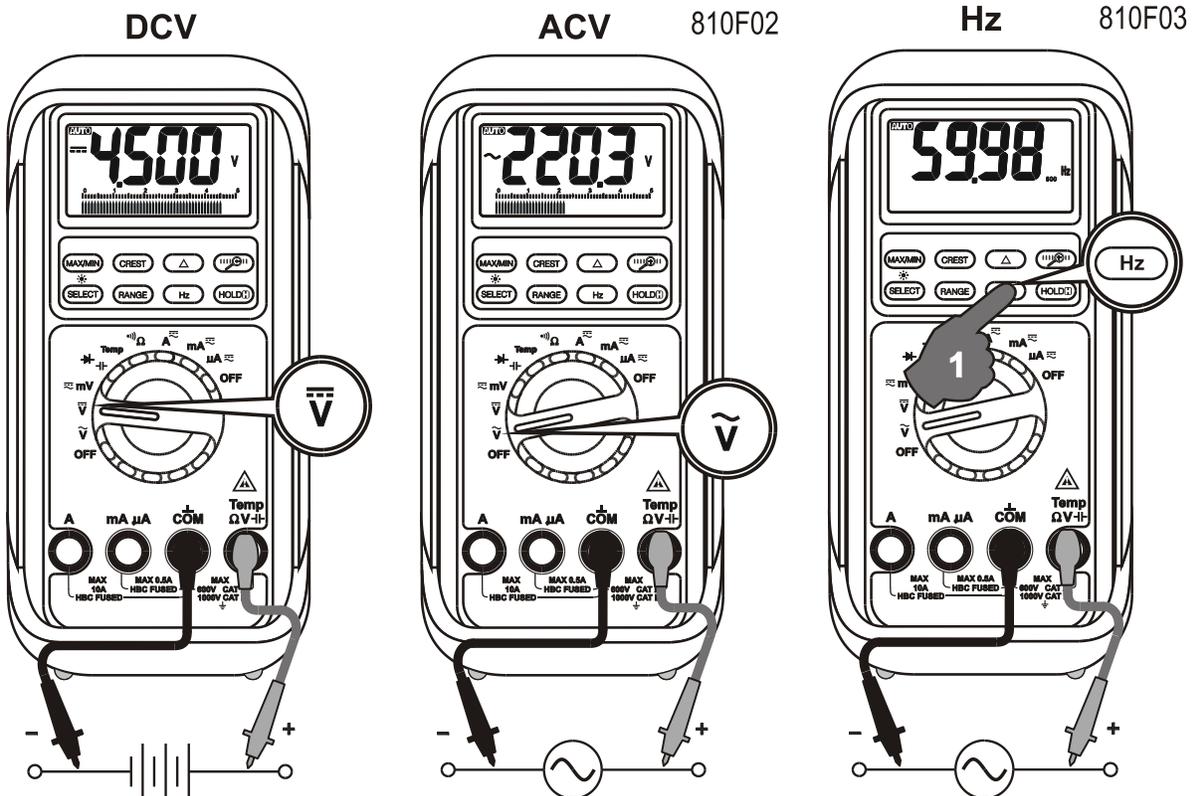
4) OPERATION

NOTE

Before and after hazardous voltage measurements, test the voltage function on a known source such as line voltage to determine proper meter functioning.

DC Voltage, AC Voltage, & Hz Frequency functions

mV function defaults at DC. Press **SELECT** button momentarily to select AC. Press the Hz push-button momentarily to activate or to exit Hz.



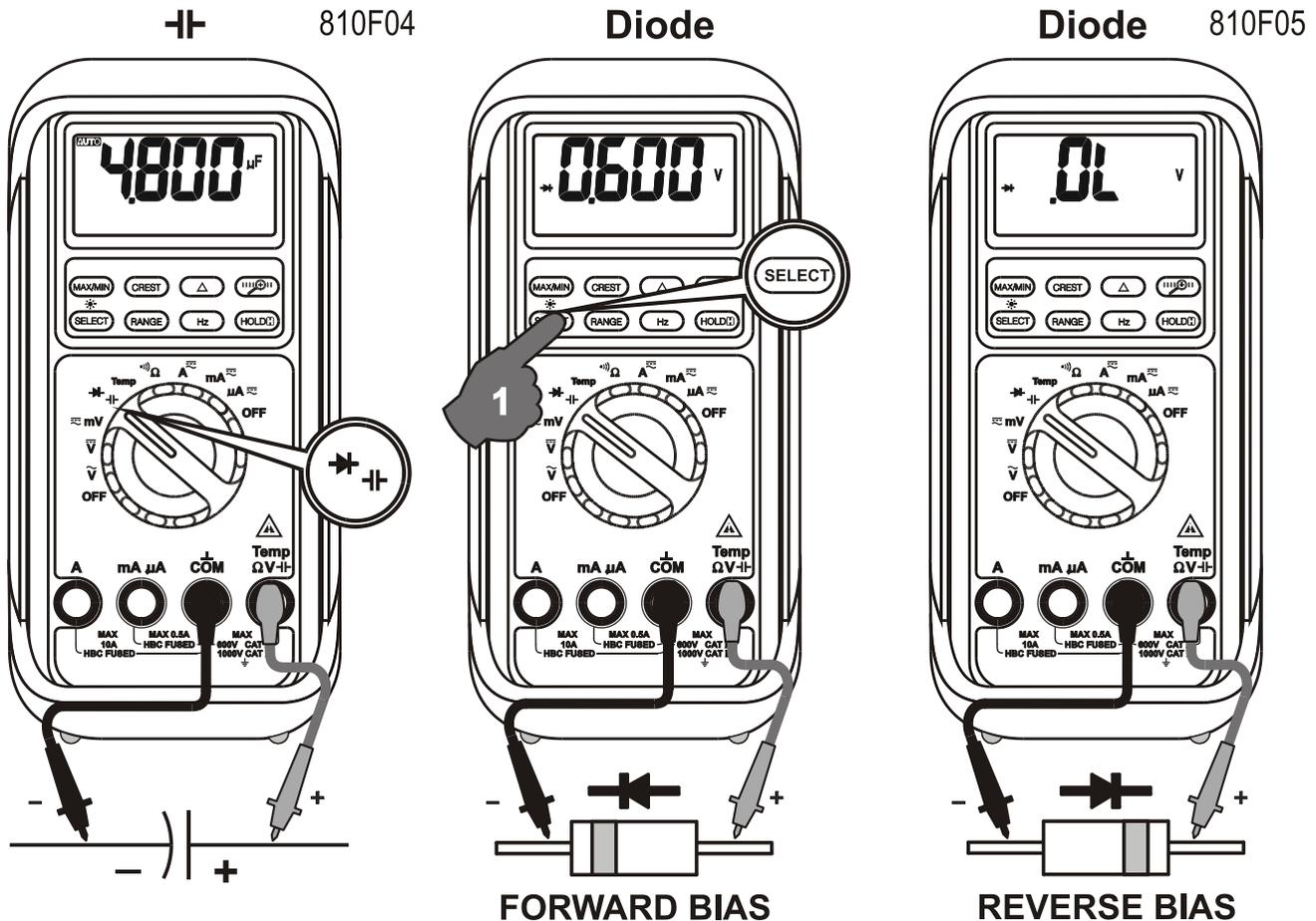
Note: Input sensitivity varies automatically with function range selected before activating the Hz function. mV function has the highest (300mV) and the 1000V range has the lowest (300V). It is recommended to first measure the signal voltage (or current) level then activate the Hz function in that voltage (or current) range to automatically set the most appropriate trigger level. You can also press the **RANGE** button momentarily to select another trigger level manually. If the Hz reading becomes unstable, select lower sensitivity to avoid electrical noise. If the reading shows zero, select higher sensitivity.

⚡ Capacitance, ⚡ Diode test function

Default at ⚡. Press **SELECT** button momentarily to select ⚡ Diode test function.

NOTE

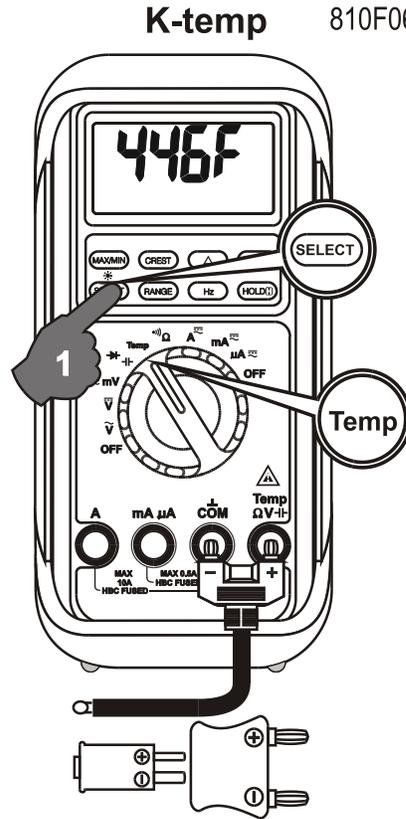
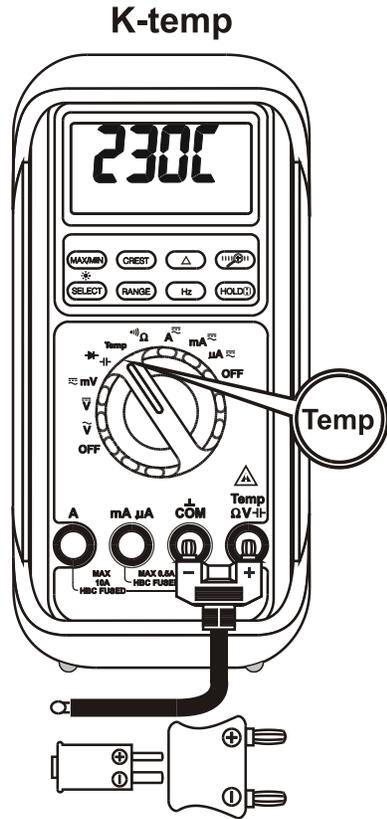
Discharge capacitors before making any measurement. Large value capacitors should be discharged through an appropriate resistance load.



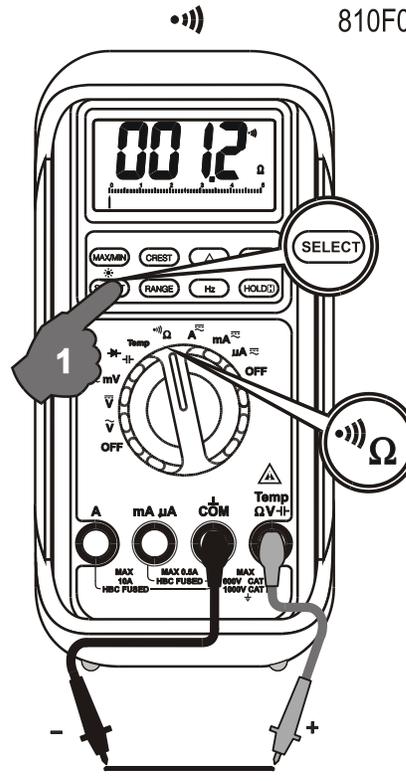
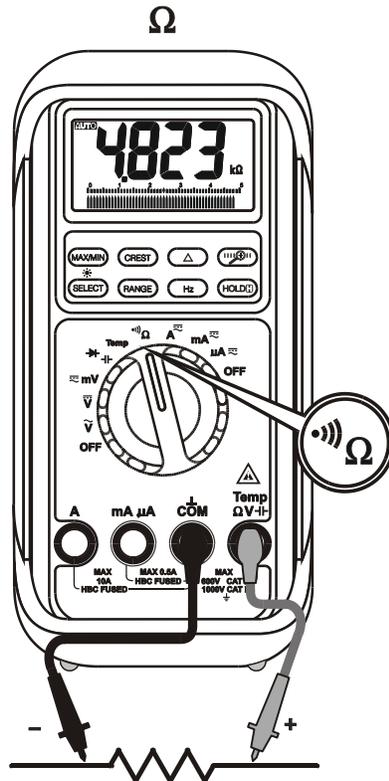
Normal forward voltage drop (forward biased) for a good silicon diode is between 0.400V to 0.900V. A reading higher than that indicates a leaky diode (defective). A zero reading indicates a shorted diode (defective). An OL indicates an open diode (defective). Reverse the test leads connections (reverse biased) across the diode. The digital display shows OL if the diode is good. Any other readings indicate the diode is resistive or shorted (defective).

Temperature function (Models 815s & 817s only)

Press **SELECT** button momentarily to toggle between °C and °F readings, and the new setting will be saved automatically in the non-volatile memory as power up default.



Note: Be sure to insert the banana plug K-type temperature bead probe Bkp60 with correct **+** **-** polarities. You can also use a plug adapter Bkb32 (Optional purchase) with banana pins to K-type socket to adapt other standard K type mini plug temperature probes.

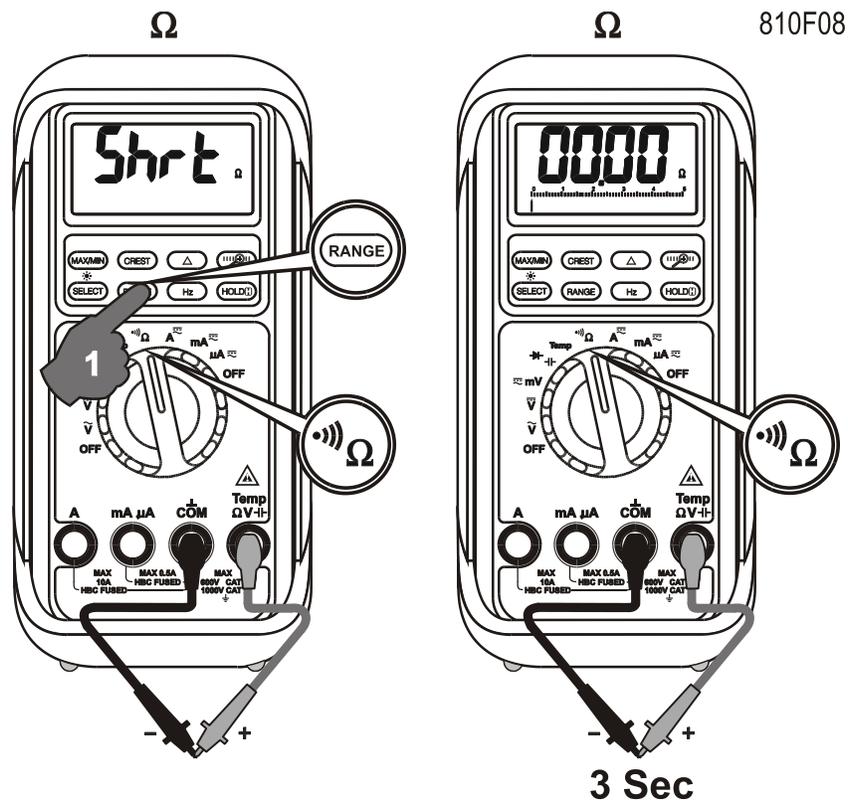


Ω Resistance, Ω) Continuity functions

Default at Ω . Press **SELECT** button momentarily to select Ω) Continuity function that is convenient for checking wiring connections and operation of switches. A continuous beep tone indicates a complete wire.

NOTE

Using resistance and continuity function in a live circuit will produce false results and may damage the instrument. In many cases the suspected component must be disconnected from the circuit to obtain an accurate reading



Auto leads resistance calibration

When entering the 50Ω range *manually* by **RANGE** button for high precision low resistance measurement, this feature will prompt you to short the inputs for calibration. The display shows "Shrt". Simply short the leads for about 3 seconds until the display shows zero, then the resistance in the leads and in the internal protection circuitry of the meter is compensated automatically. The compensation value can be as much as 5Ω . If you need a compensation value that is higher than that, Relative mode is recommended.

*The shortcut is to short the test leads in auto-ranging resistance mode until the meter enters the lowest 50Ω range automatically, press the **RANGE** button momentarily to*

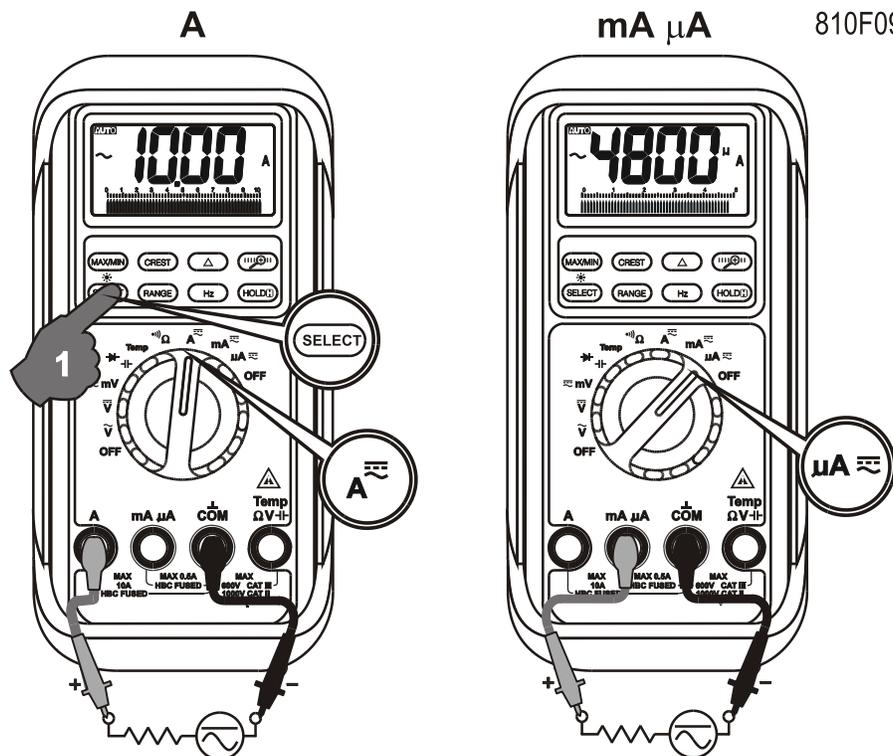
get the “Shrt” prompt, then wait about 3 more seconds until the display shows zero.

Note: The calibration stays until you change ranges, functions, or go back to auto-ranging mode.

μA , mA, and A Current functions

Default at DC. Press **SELECT** button momentarily to select AC.

*Note: When measuring a 3-phase system, special attention should be taken to the phase-to-phase voltage which is significantly higher than the phase-to-earth voltage. To avoid exceeding the voltage rating of the protection fuse(s) accidentally, always consider the phase-to-phase voltage as the working voltage for the protection fuse(s).

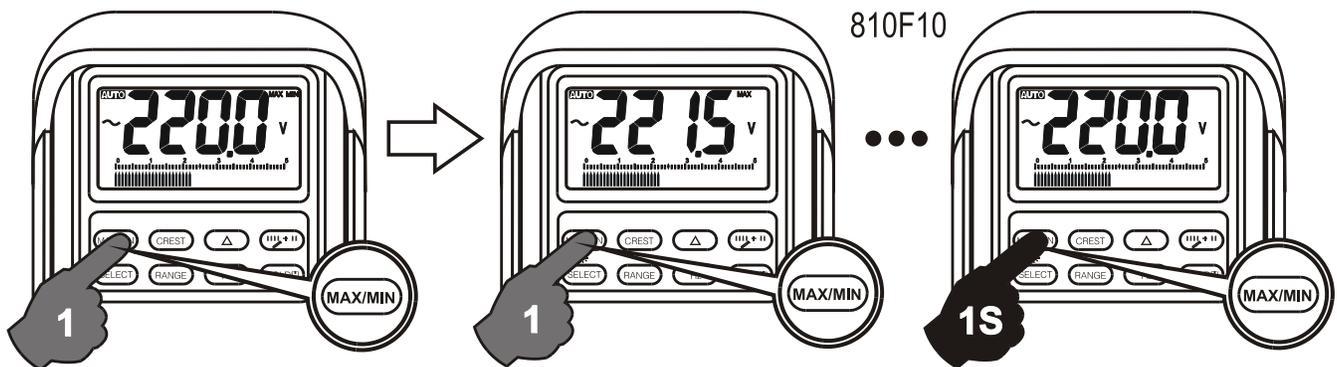


PC-COMM computer interface capabilities

The instrument equips with an optical isolated interface port at the meter back for data communication. Optional purchase PC interface kit BRUA-85Xa (BC-85Xa RS232C optical adapter cable + Bs8151X software CD + BUA-2303 USB-to-Serial adaptor) is required to connect the meter to the PC computer. The Bs8151X Data Recording System software equips with a digital meter, an analog meter, a comparator meter, and a Data Graphical recorder. Refer to the README file in the interface kit for further details.

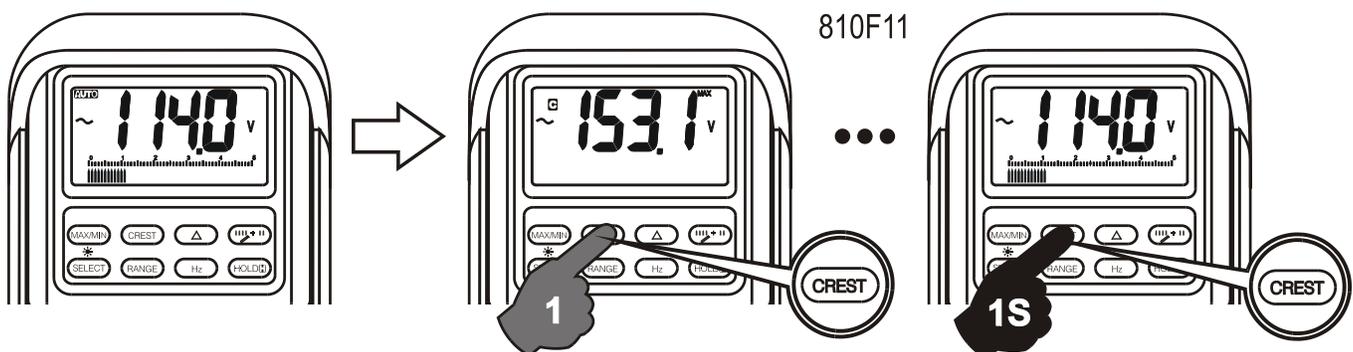
50ms MAX/MIN at fast 20/s measurement mode (Models 815s & 817s only)

Press **MAX/MIN** button momentarily to activate MAX/MIN recording mode. The LCD annunciators “MAX MIN” turn on, and the reading update rate will be increased to 20/second. The meter beeps when new maximum or minimum reading is updated. Press the button momentarily to read throughout the Maximum (MAX), Minimum (MIN), and Maximum minus Minimum (MAX-MIN) readings. Press the button for 1 second or more to exit MAX/MIN mode. Auto Power Off feature will be disabled automatically in this mode.



0.8ms CREST capture mode (Models 815s & 817s only)

Press **CREST** button momentarily to activate CREST (Instantaneous Peak-Hold) mode to capture voltage or current signal duration as short as 0.8ms. This mode is available in DCV, ACV, DCA, & ACA functions. The LCD annunciators “C” & “MAX” turn on. The meter beeps when new maximum or minimum reading is updated. Press the button momentarily to read throughout the Maximum (MAX), Minimum (MIN), and Maximum minus Minimum (MAX-MIN) readings. Press the button for 1 second or more to exit CREST capture mode. Auto Power Off feature will be disabled automatically in this mode.



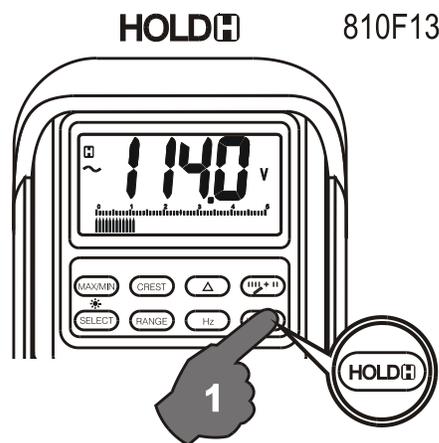
Backlighting display

Press the **SELECT** button for 1 second or more to turn on or off the display backlight function. The backlight will also be turned off automatically after 256 seconds to extend battery life.



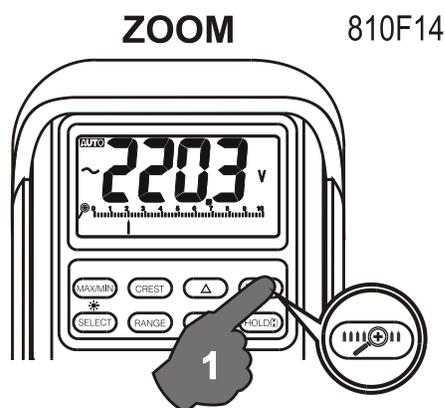
Hold

The hold function freezes the display for later view. Press the **HOLD** button momentarily to activate or to exit the hold function



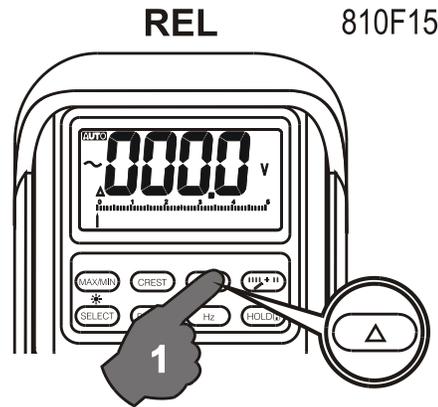
Zoom 5x analog pointer (Models 815s & 817s only)

The Zoom mode analog pointer magnifies up to 5 times the regular analog bar graph resolution to show minute signal changes with a single analog pointer. It is virtually equivalent to the bar graph resolution of $5 \times 50 = 250$ segments.



△ Relative mode (Models 815s & 817s only)

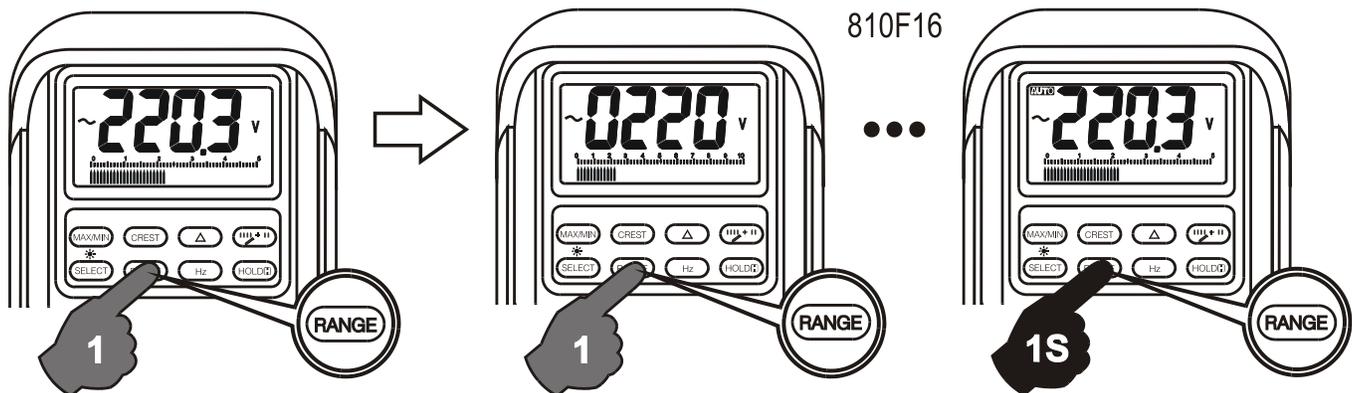
Relative zero allows the user to offset the meter consecutive measurements with the displaying reading as the reference value. Practically all displaying readings can be set as relative reference value including MAX/MIN feature readings. Press the **△** button momentarily to activate and to exit relative zero mode.



Manual or Auto-ranging

Press the **RANGE** button momentarily to select manual-ranging, and the meter will remain in the range it was in, the LCD annunciator **AUTO** turns off. Press the button momentarily again to step through the ranges. Press and hold the button for 1 second or more to resume auto-ranging.

Note: Manual ranging feature is not available in Hz function.



Beep-Jack™ Input Warning

The meter beeps as well as displays “InEr” to warn the user against possible damage to the meter due to improper connections to the μ A, mA, or A input jacks when other function (like voltage function) is selected.

Set Beeper Off

Press the **Hz** button while turning the meter on to disable the Beeper feature.

Auto Power Off (APO)

The Auto Power Off (APO) mode turns the meter off automatically to extend battery life after approximately 17 minutes of no activities. Activities are specified as: 1) Rotary switch or push button operations, and 2) Significant measuring readings of above 10% of range or non-OL Ω readings. That is, the meter will intelligently avoid entering the APO mode when it is under normal measurements. To wake up the meter from APO, press the **SELECT** button momentarily or turn the rotary switch to the OFF position and then turn back on again. Always turn the rotary switch to the OFF position when the meter is not in use

Disabling Auto Power Off

Press the **RANGE** button while turning the meter on to disable the Auto Power Off (APO) feature.

5) MAINTENANCE

NOTE

To avoid electrical shock, disconnect the meter from any circuit, remove the test leads from the input jacks and turn OFF the meter before opening the case. Do not operate with open case. Install only the same type of fuse or equivalent

Calibration

Periodic calibration at intervals of one year is recommended to maintain meter accuracy. Accuracy is specified for a period of one year after calibration.

If self-diagnostic message "rE-O" is being displayed while powering on, the meter is re-organizing internal parameters. Do not switch off the meter then, and it will be back to normal measurement shortly. However, if self-diagnostic message "C_Er" is being displayed while powering on, some meter ranges might be largely out of specifications. To avoid mis-leading measurements, stop using the meter and send it for re-calibration. Refer to the LIMITED WARRANTY section for obtaining warranty or repairing service.

Cleaning and Storage

Periodically wipe the case with a damp cloth and mild detergent; do not use abrasives or solvents. If the meter is not to be used for periods of longer than 60 days, remove the battery and store it separately

Trouble Shooting

If the instrument fails to operate, check battery, fuses, leads, etc., and replace as necessary. Double check operating procedure as described in this user's manual.

If the instrument voltage-resistance input terminal has subjected to high voltage transient (caused by lightning or switching surge to the system) by accident or abnormal conditions of operation, the series fusible resistors will be blown off (become high impedance) like fuses to protect the user and the instrument. Most measuring functions through this terminal will then be open circuit. The series fusible resistors and the spark gaps should then be replaced by qualified technician. Refer to the LIMITED WARRANTY section for obtaining warranty or repairing service.

Battery and Fuse replacement

Battery use:

Single 9V battery NEDA1604, JIS006P or IEC6F22

Fuses:

Fuse (FS1) for μ mA current input:

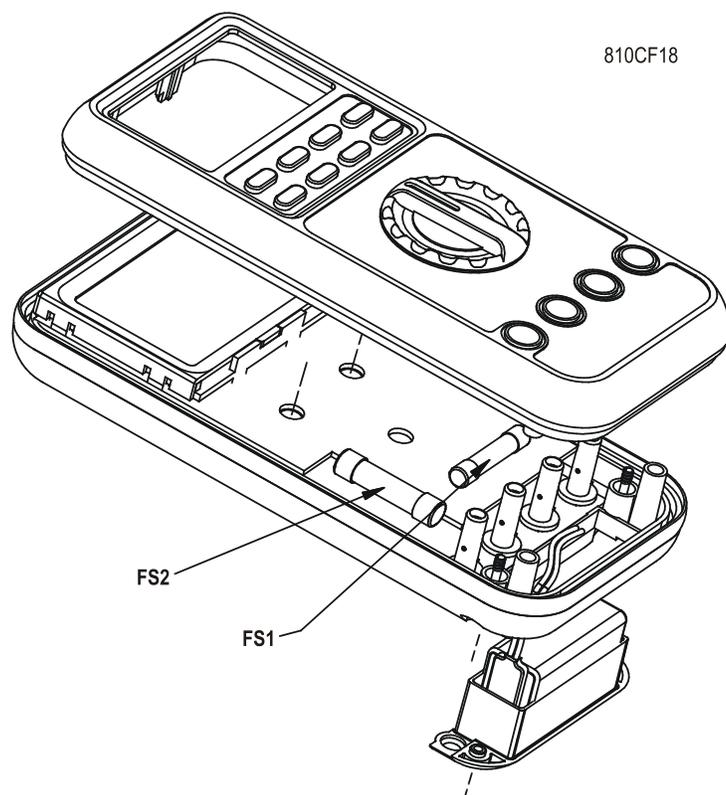
0.44A/1000V, IR 10kA or better, F fuse; Dimension: 10 x 35 mm

Fuse (FS2) for A current input:

11A/1000V, IR 20kA or better, F fuse; Dimension: 10 x 38 mm

Battery replacement for models with battery access door:

Loosen the 2 screws from the battery access door of the case bottom. Lift the battery access door and thus the battery compartment up. Replace the battery. Re-fasten the screws.



Fuse replacement (and also Battery replacement for splash proof version without battery access door):

Loosen the 4 screws from the case bottom. Lift the end of the case bottom nearest the input jacks until it unsnaps from the case top. Replace the blown fuse(s) and/or the battery. Replace the case bottom, and ensure that all the gaskets are properly seated and the two snaps on the case top (near the LCD side) are engaged. Re-fasten the screws.

6) SPECIFICATIONS

GENERAL SPECIFICATIONS

Display: 3-4/5 digits 5000 counts LCD display

Update Rate:

Digital Data 5 per second nominal;

52 Segments Bar-graph 60 per second nominal

AC Sensing: True RMS for Models 812s & 817s, and average sensing for Models 811s & 815s

Operating Temperature: 0°C to 45°C

Relative Humidity: Maximum relative humidity 80% for temperature up to 31°C decreasing linearly to 50% relative humidity at 45°C

Storage Temperature: -20°C to 60°C, 80% R.H. (with battery removed)

Pollution degree: 2

Altitude: Operating below 2000m

Temperature Coefficient: nominal $0.15 \times (\text{specified accuracy}) / ^\circ\text{C} @ (0^\circ\text{C} - 18^\circ\text{C} \text{ or } 28^\circ\text{C} - 45^\circ\text{C})$, or otherwise specified

Overload Protections:

μA & mA : 0.44A/1000V, IR 10kA, F fuse

A : 11A/1000V, IR 20kA, F fuse

V : 1100V DC/AC rms

mV, Ω , & Others : 1000V DC/AC rms

Safety: Double insulation per IEC/EN/BSEN/CSA_C22.2_No./UL standards of 61010-1 Ed. 3.1, 61010-2-033 Ed. 2.0 and IEC/UL/EN/BSEN 61010-031 Ed. 2.0 to Measurement Categories III 1000V AC & DC and Category IV 600V AC & DC

Transient protection: 8kV (1.2/50 μs surge)

E.M.C.: Meets EN61326-1

In an RF field of 3V/m:

Capacitance function is not specified

Other function ranges: Total Accuracy = Specified Accuracy + 100 digits

Performance above 3V/m is not specified

Power Supply: Single standard 9V battery NEDA1604, JIS006P or IEC6F22

Power Consumption: 4.3 mA typical

Low Battery: Below approx. 7V

APO Timing: Idle for 17 minutes

APO Consumption: 50 μA typical

Dimension: L186mm X W87mm X H35.5mm; L198mm X W97mm X H55mm with holster

Weight: 340 gm; 430 gm with holster

Accessories: Test leads (pair); Holster; Battery (installed); User's manual; Bkp60 banana plug K type thermocouple (Models 815s & 817s only)

Optional Accessories: BRUA-85Xa PC interface kit (BC-85Xa RS232 optical adapter cable)

+ Bs8151X software CD + BUA-2303 USB-to-Serial adaptor); Bkb32 banana plugs to K-type socket plug adapter (Models 815s & 817s only)

Special Features:

All models:

Data-Hold; Range-Hold; Backlighted Display; Optional PC-interface capabilities; Audible & visible input warning

Models 815s & 817s only:

50ms Record MAX-MIN readings at fast 20/second measurement mode; 0.8ms Crest (Instantaneous Peak-Hold) MAX-MIN readings; Relative-Zero offset mode; Zoom 5x analog pointer at 60/s

ELECTRICAL SPECIFICATIONS

Accuracy is +/- (% reading digits + number of least significant digits) or otherwise specified, at 23°C +/- 5°C & less than 75% R.H.

True RMS Models 812s & 817s ACV & ACA accuracies are specified from 5 % to 100 % of range or otherwise specified. Maximum Crest Factor <3:1 at full scale & <6:1 at half scale, and with frequency spectrums, besides fundamentals, fall within the meter specified AC bandwidth for non-sinusoidal waveforms.

DC Voltage

RANGE	Accuracy
50.00 mV	0.12% + 2d
500.0 mV	0.06% + 2d
5.000V, 50.00V, 500.0V, 1000V	0.08% + 2d

NMRR : >60dB @ 50/60Hz

CMRR : >120dB @ DC, 50/60Hz, Rs=1kΩ

Input Impedance: 10MΩ, 16pF nominal
(44pF nominal for 50mV & 500mV ranges)

AC Voltage

RANGE	Accuracy
50Hz -- 60Hz	
50.00mV, 500.0mV, 5.000V, 50.00V, 500.0V, 1000V	0.5% + 3d
40Hz -- 500Hz	
50.00mV, 500.0mV	0.8% + 3d
5.000V, 50.00V, 500.0V	1.0% + 4d
1000V	1.2% + 4d
Up to 20kHz	
50.00mV, 500.0mV	0.5dB*
5.000V, 50.00V, 500.0V	3dB*
1000V	Unspec'd

*Specified from 30% to 100% of range

CMRR : >60dB @ DC to 60Hz, Rs=1kΩ

Input Impedance: 10MΩ, 16pF nominal

(44pF nominal for 50mV & 500mV ranges)

DC Current

RANGE	Accuracy	Burden Voltage
500.0 μ A	0.2%+4d	0.15mV/ μ A
5000 μ A		0.15mV/ μ A
50.00mA		3.3mV/mA
500.0mA		3.3mV/mA
5.000A		45mV/A
10.00A*		45mV/A

*10A continuous, >10A 20A for 30 second max with 5 minutes cool down interval

AC Current

RANGE	Accuracy	Burden Voltage
50Hz -- 60Hz		
500.0 μ A	0.6%+3d	0.15mV/ μ A
5000 μ A		0.15mV/ μ A
50.00mA		3.3mV/mA
500.0mA	1.0%+3d	3.3mV/mA
5.000A	0.6%+3d	45mV/A
10.00A*		45mV/A
40Hz --1kHz		
500.0 μ A	0.8%+4d	0.15mV/ μ A
5000 μ A	0.8%+4d	0.15mV/ μ A
50.00mA	0.8%+4d	3.3mV/mA
500.0mA	1.0%+4d	3.3mV/mA
5.000A	0.8%+4d	45mV/A
10.00A*	0.8%+4d	45mV/A

*10A continuous, >10A to 20A for 30 second max with 5 minutes cool down interval

Ohms

RANGE	Accuracy
50.00 Ω	0.3% + 6d
500.0 Ω	0.1% + 3d
5.000k Ω , 50.00k Ω , 500.0k Ω	0.1% + 2d
5.000M Ω	0.4% + 3d
50.00M Ω	2.0% + 5d

Open Circuit Voltage : < 1.3VDC
(< 3VDC for 50 Ω & 500 Ω ranges)

Audible Continuity Tester

Audible threshold : between 20 Ω and 200 Ω . Fast response time < 100 μ s

Crest mode for V & A functions (Models 815s & 817s only)

Accuracy: Specified accuracy \pm 150 digits for changes > 0.8 ms in duration

Frequency

Function	Sensitivity (Sine RMS)	Range
mV	300mV	10Hz - 125kHz
5V	2V	10Hz - 125kHz
50V	20V	10Hz - 20kHz
500V	80V	10Hz - 1kHz
1000V	300V	10Hz - 1kHz
Ω , Cx, diode	300mV	10Hz - 125kHz
μ A, mA, A	10% F.S.	10Hz - 125kHz

Accuracy: 0.01% + 2d

Diode Tester

Range	Accuracy	Test Current (Typical)	Open Circuit Voltage
2.000V	1%+1d	0.4mA	< 3.5 VDC

Capacitance

RANGE	Accuracy*
50.00nF	0.8% + 3d
500.0nF	0.8% + 3d
5.000 μ F	1.5% + 3d
50.00 μ F	2.5% + 3d
500.0 μ F**	3.5% + 5d
9999 μ F**	5.0% + 5d

*Accuracies with film capacitor or better

**In manual-ranging mode, measurements not specified below 45.0 μ F and 450 μ F for 500.0 μ F and 9999 μ F ranges respectively

Temperature (Models 815s & 817s only)

RANGE	Accuracy*
-50 °C TO 1000 °C	0.3% + 3d
-58 °F TO 1832 °F	0.3% + 5d

*Thermocouple range & accuracy not included

LIMITED WARRANTY

BRYMEN warrants to the original product purchaser that each product it manufactures will be free from defects in material and workmanship under normal use and service within a period of one year from the date of purchase. BRYMEN's warranty does not apply to accessories, fuses, fusible resistors, spark gaps, batteries or any product which, in BRYMEN's opinion, has been misused, altered, neglected, or damaged by accident or abnormal conditions of operation or handling.

To obtain warranty service, contact your nearest BRYMEN authorized agent or send the product, with proof of purchase and description of the difficulty, postage and insurance prepaid, to BRYMEN TECHNOLOGY CORPORATION. BRYMEN assumes no risk for damage in transit. BRYMEN will, at its option, repair or replace the defective product free of charge. However, if BRYMEN determines that the failure was caused by misused, altered, neglected, or damaged by accident or abnormal conditions of operation or handling, you will be billed for the repair.

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